GRANT OPPORTUNITIES

Gupta College of Science

General (All Departments)

NSF INCLUDES Planning Grants
National Science Foundation
Due Date: 12/03/2019
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320243

In 2016, the National Science Foundation (NSF) unveiled a set of “Big Ideas,” 10 bold, long-term research and process ideas that identify areas for future investment at the frontiers of science and engineering (see https://www.nsf.gov/news/special_reports/big_ideas/index.jsp). The Big Ideas represent unique opportunities to position our Nation at the cutting edge of global science and engineering leadership by bringing together diverse disciplinary perspectives to support convergence research. As such, when responding to this solicitation, even though proposals must be submitted to the Education and Human Resources (EHR) Directorate/Division of Human Resource Development (HRD), once received, the proposals will be managed by a cross-disciplinary team of NSF Program Directors. Through this solicitation, NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES) will support Planning Grants to build capacity for the development of collaborative infrastructure to: (a) facilitate innovative partnerships, networks, and theories of action for broadening participation in science, technology, engineering, and mathematics (STEM) at scale and (b) lead to the establishment of future centers, alliances, or other large-scale networks to address a broadening participation challenge. While this solicitation is open to all, NSF INCLUDES Design and Development Launch Pilots are especially encouraged to apply, as a Planning Grant could serve as an intermediate conduit for bringing their exploratory pilot work to scale. A hallmark of NSF INCLUDES is to support the development of collaborative infrastructure to achieve systemic change. Collaborative infrastructure refers to the process by which partnering organizations come together with a shared vision; map out mutually reinforcing activities; develop goals, objectives, and measures to chart their progress; engage in constant communication; and advance the potential for expansion, sustainability, and scaling that would not be possible otherwise. NSF INCLUDES, one of the 10 Big Ideas, is a comprehensive national initiative to enhance U.S. leadership in STEM discoveries and innovations focused on NSF’s commitment to diversity, inclusion, and broadening participation in these fields. The vision of NSF INCLUDES is to catalyze the STEM enterprise to work collaboratively for inclusive change, resulting in a STEM workforce that reflects the population of the Nation. NSF INCLUDES features a National Network composed of Design and Development Launch Pilots, Alliances, a Coordination Hub, NSF-funded broadening participation projects, other relevant NSF-funded projects, and other organizations that support the development of talent from all sectors of society to build an inclusive STEM workforce.

Use of the NASA Physical Sciences Informatics System
National Aeronautics and Space Administration – NASA Headquarters
Due Date: 12/16/2019
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320107

The PSI system (http://psi.nasa.gov) is an online, publicly accessible database of completed physical science reduced-gravity flight experiments conducted on the ISS, on Space Shuttle flights, on Free Flyers, or on commercial cargo flights to and from the ISS, and related ground-based studies. It is a tool designed for researchers to data mine information from reduced-gravity physical sciences experiments and use it to further science in accordance with the open science approach, while also meeting the requirements of the nation’s Open Data Policy. This NRA solicits ground-based research proposals that present a compelling case on how the experimental data from the PSI system will be used to promote the advancement of further research. Proposers must show a clear path from the scientific data obtained from the PSI system to the proposed investigation. In addition, the project must address an important problem in the proposed area of research and advance scientific knowledge or technology.
Explosives Ordnance Disposal (EOD) FY20 Science & Technology Program BAA
Department of Defense – Office of Naval Research
Due Date: 12/20/2019

https://www.grants.gov/web/grants/view-opportunity.html?oppId=320366
Development of Advanced Technologies for Diagnostic Sensors and Neutralization of Buried & Surface Munitions in Land Environments

Environmental Education Local Grants Program for Region 4 – Solicitation Notice for 2020
Environmental Protection Agency
Due Date: 01/06/2020

https://www.grants.gov/view-opportunity.html?oppId=321844
The purpose of the Environmental Education Local Grants Program in Region 4 is to support locally-focused environmental education projects that increase public awareness and knowledge about environmental and conservation issues and provide the skills that participants in its funded projects need to make informed decisions and take responsible actions toward the environment.

AmeriCorps State and National Grants FY 2020
Corporation for National and Community Service
Due Date: 01/08/2020

https://www.grants.gov/web/grants/view-opportunity.html?oppId=320557
AmeriCorps grants are awarded to eligible organizations proposing to engage AmeriCorps members in evidence-based or evidence-informed interventions to strengthen communities. An AmeriCorps member is an individual who engages in community service through an approved national service position. Members may receive a living allowance and other benefits while serving. Upon successful completion of their service, members earn a Segal AmeriCorps Education Award from the National Service Trust that members can use to pay for higher education expenses or apply to qualified student loans.

EPSCoR Research Infrastructure Improvement Program: Track-2 Focused EPSCoR Collaborations (RII Track-2 FEC)
National Science Foundation
Due Date: 01/24/2020

https://www.grants.gov/web/grants/view-opportunity.html?oppId=321614
The Established Program to Stimulate Competitive Research (EPSCoR) is designed to fulfill the mandate of the National Science Foundation (NSF) to promote scientific progress nationwide. A jurisdiction is eligible to participate in EPSCoR programs if its level of NSF research support is equal to or less than 0.75 percent of the total NSF research and related activities budget for the most recent three-year period. Through this program, NSF establishes partnerships with government, higher education, and industry that are designed to effect sustainable improvements in a jurisdiction’s research infrastructure, Research and Development (R&D) capacity, and hence, its R&D competitiveness. RII Track-2 FEC builds interjurisdictional collaborative teams of EPSCoR investigators in scientific focus areas consistent with NSF priorities. Projects are investigator-driven and must include researchers from at least two RII-eligible jurisdictions with complementary expertise and resources necessary to tackle those projects, which neither party could address as well or rapidly alone. The Science, Technology, Engineering, and Mathematics (STEM) research and education activities should seek to broaden participation through the strategic inclusion and integration of different types of individuals, institutions, and sectors throughout the project. Proposals must describe a comprehensive and integrated vision to drive discovery and build sustainable STEM capacity that exemplifies diversity of all types (individual, institutional, geographic, and disciplinary). The development of diverse early-career faculty is a critical component of this sustainable STEM capacity. For FY 2020, RII Track-2 FEC proposals are invited on a single topic: “Harnessing the Data Revolution to solve problems of national importance.”
Artificial Intelligence (AI) has advanced tremendously and today promises personalized healthcare; enhanced national security; improved transportation; and more effective education, to name just a few benefits. Increased computing power, the availability of large datasets and streaming data, and algorithmic advances in machine learning (ML) have made it possible for AI development to create new sectors of the economy and revitalize industries. Continued advancement, enabled by sustained federal investment and channeled toward issues of national importance, holds the potential for further economic impact and quality-of-life improvements. The 2019 update to the National Artificial Intelligence Research and Development Strategic Plan, informed by visioning activities in the scientific community as well as interaction with the public, identifies as its first strategic objective the need to make long-term investments in AI research in areas with the potential for long-term payoffs in AI. This program, a joint effort of the National Science Foundation (NSF), U.S. Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA), U.S. Department of Homeland Security (DHS) Science & Technology Directorate (S&T), U.S. Department of Transportation (DOT) Federal Highway Administration (FHWA), and U.S. Department of Veterans Affairs (VA), seeks to enable such research through AI Research Institutes. This program solicitation describes two tracks: Planning and Institute tracks. Submissions to the Planning track are encouraged in any areas of foundational and use-inspired research appropriate to NSF and its partner organizations. Proposals for the Institute track must have a principal focus in one or more of the following themes, detailed in the Program Description under "Institute Track": Trustworthy AI; Foundations of Machine Learning; AI-Augmented Learning; AI for Accelerating Molecular Synthesis and Manufacturing; and AI for Discovery in Physics.

The Science and Technology Studies (STS) program supports research that uses historical, philosophical, and social scientific methods to investigate the intellectual, material, and social facets of the scientific, technological, engineering and mathematical (STEM) disciplines. It encompasses a broad spectrum of topics including interdisciplinary studies of ethics, equity, governance, and policy issues that are closely related to STEM disciplines.

The Science of Science: Discovery, Communication, and Impact (SoS:DCI) program is designed to increase the public value of scientific activity. The program pursues this goal by supporting basic research in three fundamental areas: How to increase the rate of socially beneficial discovery; how to improve science communication outcomes; and how to expand the societal benefits of scientific activity. The SoS:DCI program, which builds upon the former Science of Science & Innovation Policy (SciSIP) program, funds research that builds theoretical and empirical understandings of these three areas. With this goal in mind, proposals should: Develop data, models, indicators, and associated analytical tools that constitute and enable transformative advances rather than incremental change. Identify ethical challenges and mitigate potential risks to people and institutions. Provide credible metrics and rigorous assessments of their proposed project's impact. Include robust data management plans with the goal to increase the usability, validity, and reliability of scientific materials. The SoS:DCI program places a high priority on broadening participation. It encourages leadership from junior faculty, women, members of historically underrepresented groups, and proposals from Minority Serving Institutions (MSIs), Research Undergraduate Institutions (RUIs), and EPSCoR states. Of particular interest are proposals that have the highest potential to strengthen America's global leadership in science and increase national competitiveness across a broad range of domains. These include proposals that analyze strategies for strengthening and diversifying the scientific workforce, as well as ways to more effectively cultivate high-impact discovery across sectors. The program strongly encourages convergent research and collaboration.
Science of Science – Doctoral Dissertation Research Improvement Grants
National Science Foundation
Due Date: 02/10/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320858

The Science of Science: Discovery, Communication, and Impact (SOS:DCI) program is designed to understand the scientific research enterprise and increase the public value of scientific activity. The program pursues this goal by supporting basic research in three fundamental areas: How to increase the rate of socially beneficial discovery; how to improve science communication outcomes; and how to expand the societal benefits of scientific activity. Doctoral Dissertation Research Improvement Grants (DDRIGs) The Doctoral Dissertation Research Improvement Grants funding opportunity is designed to improve the quality of dissertation research. DDRIG awards provide funds for items not normally available through the student's university such as enabling doctoral students to undertake significant data-gathering projects and to conduct field research in settings away from their campus. DDRIGs do not provide cost-of-living or other stipends or tuition. Outstanding DDRIG proposals specify how the knowledge to be created advances science of science.

Ethical and Responsible Research
National Science Foundation
Due Date: 02/24/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320838

Ethical and Responsible Research (ER2) funds research projects that identify (1) factors that are effective in the formation of ethical STEM researchers and (2) approaches to developing those factors in all STEM fields that NSF supports. ER2 solicits proposals for research that explores the following: 'What constitutes responsible conduct for research (RCR), and which cultural and institutional contexts promote ethical STEM research and practice and why?' Do certain labs have a 'culture of academic integrity'? What practices contribute to the establishment and maintenance of ethical cultures and how can these practices be transferred, extended to, and integrated into other research and learning settings? Factors one might consider include: honor codes, professional ethics codes and licensing requirements, an ethic of service and/or service learning, life-long learning requirements, curricula or memberships in organizations (e.g. Engineers without Borders) that stress responsible conduct for research, institutions that serve under-represented groups, institutions where academic and research integrity are cultivated at multiple levels, institutions that cultivate ethics across the curriculum, or programs that promote group work, or do not grade. Successful proposals typically have a comparative dimension, either between or within institutional settings that differ along these or among other factors, and they specify plans for developing interventions that promote the effectiveness of identified factors. ER2 research projects will use basic research to produce knowledge about what constitutes or promotes responsible or irresponsible conduct of research, and how to best instill this knowledge into researchers and educators at all career stages. In some cases, projects will include the development of interventions to ensure ethical and responsible research conduct. Proposals for awards from minority-serving institutions (e.g., Tribal Colleges and Universities, Historically Black Colleges and Universities, Hispanic-Serving Institutions, Alaska Native or Native Hawaiian Serving Institutions), women's colleges, and organizations primarily serving persons with disabilities are strongly encouraged. Proposals including international collaborations are encouraged when those efforts enhance the merit of the proposed work by incorporating unique resources, expertise, facilities or sites of international partners. If possible, the U.S. team's international counterparts should obtain funding through other sources.

Higher Education Challenge (HEC) Grants Program
Department of Agriculture – National Institute of Food and Agriculture
Due Date: 03/23/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320953

Projects supported by the Higher Education Challenge Grants Program will: (1) address a state, regional, national, or international educational need; (2) involve a creative or non-traditional approach toward addressing that need that can serve as a model to others; (3) encourage and facilitate better working relationships in the university science and education community, as well as between universities and the private sector, to enhance program quality and supplement available resources; and (4) result in benefits that will likely transcend the project duration and USDA support.
Environmental Literacy Grants: Supporting the education of K-12 students and the public for community resilience
Department of Commerce
Due Date: 03/26/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=321575
The goal of this funding opportunity is to build environmental literacy of K-12 students and the public so they are knowledgeable of the ways in which their community can become more resilient to extreme weather and/or other environmental hazards, and become involved in achieving that resilience. Projects should build the collective environmental literacy necessary for communities to become more resilient to the extreme weather and other environmental hazards they face in the short- and long-term. Building sufficient environmental literacy in a community means that these communities are composed of individuals who are supported by formal and informal education that develop their knowledge, skills, and confidence to: (1) reason about the ways that human and natural systems interact globally and where they live, including the acknowledgement of disproportionately distributed vulnerabilities; (2) participate in scientific and/or civic processes; and (3) consider scientific uncertainty, cultural knowledge, and diverse community values in decision making.

Mid-Scale Innovations Program in Astronomical Sciences
National Science Foundation
Due date: 05/06/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320837
A vigorous Mid-Scale Innovations Program (MSIP) was recommended by the 2010 Astronomy and Astrophysics Decadal Survey, citing "many highly promising projects for achieving diverse and timely science." As described in this solicitation, the Division of Astronomical Sciences conducts a mid-scale program to support a variety of astronomical activities within a cost range up to $30M. This program is formally divided into four subcategories: 1) limited term, self-contained science projects; 2) longer term mid-scale facilities; 3) development investments for future mid-scale and large-scale projects; and 4) community open access capabilities. MSIP will emphasize both strong scientific merit and a well-developed plan for student training and involvement of a diverse workforce in instrumentation, facility development, or data management.

Maximizing Investigators’ Research Award
Department of Health and Human Services – National Institutes of Health
Due Date: Ongoing through 05/17/2022
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320413
The Maximizing Investigators’ Research Award (MIRA) provides support for the program of research in an investigator's laboratory that is within the mission of NIGMS. The goal of MIRA is to increase the efficiency and efficacy of NIGMS funding. It is anticipated that this program will: Increase the stability of funding for NIGMS-supported investigators, which could enhance their ability to take on ambitious scientific projects and approach problems more creatively; Increase flexibility for investigators to follow important new research directions within the NIGMS mission as opportunities arise, rather than being bound to specific aims proposed in advance of the studies; More widely distribute funding among the nation’s highly talented and promising investigators to increase overall scientific productivity and the chances for important breakthroughs; Reduce the time spent by researchers writing and reviewing grant applications, allowing them to spend more time conducting research; Enable investigators to devote more time and energy to mentoring trainees in a more stable research environment. This FOA allows both new applications from eligible NIGMS-funded investigators and renewal applications from current established and early-stage MIRA grantees.

NRL Long Range Broad Agency (BAA) for Basic and Applied Research
Department of Defense – Naval Research Laboratory
Due Date: 09/05/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320355
The NRL’s Broad Agency Announcement (BAA) issued under the provisions of paragraphs 35.016 and 6.102(d)(2) of the Federal Acquisition Regulations (FAR). Proposals may range from theoretical studies to proof-of-concept to include fabrication and delivery of a prototype. However, this is limited to research procurements for which it would be impossible to draft an adequate RFP in sufficient detail without restructuring the technical response and thus hindering competition rather than expanding it. BAA topics include all NRL sites located in the Washington, DC area, the Stennis Space Center, MS, and Monterey, CA. Proposals submitted in response to a BAA announcement that are selected for award are considered to be the result of full and open competition and are in full compliance with the provisions of Public Law 98-369, "The Competition in Contracting Act of 1984."
NSF Dynamic Language Infrastructure – NEH Documenting Endangered Languages
National Science Foundation
Due Date: 09/15/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320854
This funding partnership between the National Science Foundation (NSF) and the National Endowment for the Humanities (NEH) supports projects to develop and advance knowledge concerning dynamic language infrastructure in the context of endangered human languages—languages that are both understudied and at risk of falling out of use. Made urgent by the imminent loss of roughly half of the approximately 7000 currently used languages, this effort aims to exploit advances in information technology to build computational infrastructure for endangered language research. The program supports projects that contribute to data management and archiving, and to the development of the next generation of researchers. Funding can support fieldwork and other activities relevant to the digital recording, documentation and analysis, and archiving of endangered language data, including the preparation of lexicons, grammars, text samples, and databases. Funding will be available in the form of one- to three-year senior research grants, fellowships from six to twelve months, and conference proposals.

Long Range Broad Agency Announcement (BAA) for Navy and Marine Corps Science & Technology
Department of Defense – Office of Naval Research
Due Date: 09/30/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=321039
The Office of Naval Research (ONR), ONR Global, and the Marine Corps Warfighting Lab (MCWL) are interested in receiving proposals for Long-Range Science and Technology (S&T) Projects which offer potential for advancement and improvement of Navy and Marine Corps operations. Readers should note that this is an announcement to declare ONR's broad role in competitive funding of meritorious research across a spectrum of science and engineering disciplines.

Environmental Engineering
National Science Foundation
Due Date: Ongoing
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320490
The Environmental Engineering program is part of the Environmental Engineering and Sustainability cluster, which also includes 1) the Nanoscale Interactions program; and 2) the Environmental Sustainability program. Environmental engineering is an interdisciplinary field that applies chemical, biological, and physical scientific principles to protect human and ecological health. The goal of the Environmental Engineering program is to support potentially transformative fundamental research that applies scientific and engineering principles to 1) prevent, minimize, or re-use solid, liquid, and gaseous discharges of pollution to soil, water, and air by closing resource loops or through other measures; 2) mitigate the ecological and human-health impacts of such releases by smart/adaptive/reactive amendments or manipulation of the environment, and 3) remediate polluted environments through engineered chemical, biological, and/or geo-physical processes. Integral to achieving these goals is a fundamental understanding of the transport and biogeochemical reactivity of pollutants in the environment. Therefore, research on environmental micro/biology, environmental chemistry, and environmental geophysics may be relevant providing the research has a clear objective of protecting human and ecological health.
Psychology

The Science of Learning and Augmented Intelligence Program
National Science Foundation
Due Date: 01/15/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320753
The Science of Learning and Augmented Intelligence Program (SL) supports potentially transformative research that develops basic theoretical insights and fundamental knowledge about principles, processes and mechanisms of learning, and about augmented intelligence - how human cognitive function can be augmented through interactions with others, contextual variations, and technological advances. The program supports research addressing learning in individuals and in groups, across a wide range of domains at one or more levels of analysis including: molecular/cellular mechanisms; brain systems; cognitive, affective, and behavioral processes; and social/cultural influences. The program also supports research on augmented intelligence that clearly articulates principled ways in which human approaches to learning and related processes, such as in design, complex decision-making and problem-solving, can be improved through interactions with others, and/or the use of artificial intelligence in technology. These could include ways of using knowledge about human functioning to improve the design of collaborative technologies that have capabilities to learn to adapt to humans. For both aspects of the program, there is special interest in collaborative and collective models of learning and/or intelligence that are supported by the unprecedented speed and scale of technological connectivity. This includes emphasis on how people and technology working together in new ways and at scale can achieve more than either can attain alone. The program also seeks explanations for how the emergent intelligence of groups, organizations, and networks intersects with processes of learning, behavior and cognition in individuals. Projects that are convergent and/or interdisciplinary may be especially valuable in advancing basic understanding of these areas, but research within a single discipline or methodology is also appropriate. Connections between proposed research and specific technological, educational, and workforce applications will be considered as valuable broader impacts but are not necessarily central to the intellectual merit of proposed research. The program supports a variety of approaches including: experiments, field studies, surveys, computational modeling, and artificial intelligence/machine learning methods.

Political Science
National Science Foundation
Due Date: 01/15/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=321633
The Accountable Institutions and Behavior (AIB) Program supports basic scientific research that advances knowledge and understanding of issues broadly related to attitudes, behavior, and institutions connected to public policy and the provision of public services. Research proposals are expected to be theoretically motivated, conceptually precise, methodologically rigorous, and empirically oriented. Substantive areas include (but are not limited to) the study of individual and group decision-making, political institutions (appointed or elected), attitude and preference formation and expression, electoral processes and voting, public administration, and public policy. This work can focus on a single case or can be done in a comparative context, either over time or cross-sectionally. The Program does not fund applied research. The Program also supports research experiences for undergraduate students and infrastructural activities, including methodological innovations. The Security and Preparedness (SAP) Program supports basic scientific research that advances knowledge and understanding of issues broadly related to global and national security. Research proposals are evaluated on the criteria of intellectual merit and broader impacts; the proposed projects are expected to be theoretically motivated, conceptually precise, methodologically rigorous, and empirically oriented. Substantive areas include (but are not limited to) international relations, global and national security, human security, political violence, state stability, conflict processes, regime transition, international and comparative political economy, and peace science. Moreover, the Program supports research experiences for undergraduate students and infrastructural activities, including methodological innovations. The Program does not fund applied research.
Accountable Institutions and Behavior
National Science Foundation
Due Date: 01/15/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320098
The Accountable Institutions and Behavior (AIB) Program supports basic scientific research that advances knowledge and understanding of issues broadly related to attitudes, behavior, and institutions connected to public policy and the provision of public services. Research proposals are expected to be theoretically motivated, conceptually precise, methodologically rigorous, and empirically oriented. Substantive areas include (but are not limited to) the study of individual and group decision-making, political institutions (appointed or elected), attitude and preference formation and expression, electoral processes and voting, public administration, and public policy. This work can focus on a single case or can be done in a comparative context, either over time or cross-sectionally. The Program does not fund applied research. The Program also supports research experiences for undergraduate students and infrastructural activities, including methodological innovations. In addition, we encourage you to examine the websites for the National Science Foundation’s Law and Science (LS) and Security and Preparedness (SAP) programs.

Research Education: Short Courses on Alzheimer’s disease and Related Dementias for the Behavioral and Social Sciences
Department of Health and Human Services – National Institutes of Health
Due Date: 01/21/2020
https://www.grants.gov/web/grants/view-opportunity.html?oppId=319522
The goal of this FOA is to support short courses geared to behavioral and social scientists who have existing expertise in aging research and can make research contributions in Alzheimer’s disease and Alzheimer’s disease-related dementias (AD/ADRD) with additional knowledge about the disease and related research resources. Fields of behavioral and social science research relevant for this FOA are health economics, labor economics, health services research, healthcare policy, public policy, demography, sociology, social epidemiology, psychology, and social neuroscience. Priority areas of focus include, but are not limited to, the following: dementia care; dementia caregiver research; cognitive and dementia epidemiology; behavioral and social pathways of AD/ADRD; role of social, contextual, environmental, and institutional factors in AD/ADRD; early psychological changes preceding AD/ADRD onset; prevention of AD/ADRD; disparities in AD/ADRD or dementia-related outcomes; and research resources and methods for studying the determinants and impact of AD/ADRD.

Complex Integrated Multi-Component Projects in Aging Research
Department of Health and Human Services – National Institutes of Health
Due Date 09/25/2022
https://www.grants.gov/web/grants/view-opportunity.html?oppId=320593
This FOA allows for applications that propose large-scale, complex research projects with multiple highly integrated components focused on a common research question relevant to aging. Such projects will likely involve an integrated multidisciplinary team of investigators within a single institution or a consortium of institutions.